

## Electric Seats



Self-Study Program No. 64

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# Electric seats

The launching of the Toledo 99 increases the offer of comfort providing equipment, presenting seats whose position can be electrically adjusted.

Two **different** independent **systems** are available, depending on whether we are dealing with the driver or passenger seat.

The **passenger's** seat has **electrical adjustment** of both the seat cushion and the backrest.

The **driver's** seat has an **electronic management**, which as well as adjusting the seats also permits the positions to be memorised. The memorisation function includes seat and external mirror adjustment and provides for a pre-set position of the right hand mirror to be selected when the reverse gear is engaged.

Thanks to the electronic management, it is possible to recover the positions memorised using the remote control or by pressing the corresponding button. On top of all this, the system comes with a complete autodiagnosis which facilitates fault finding and repair.

A **CAN-Bus** line connects all the different control units which participate in this system. This greatly simplifies the wiring harness and provides for efficient communication.

**Note:** The verification instructions and the exact working values are given in detail in the Service Manual:

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# LAYOUT AND LOCATION

The electric seats have two different control systems, one for the driver seat and one for the passenger seat.

The **passenger seat** is **electrically** adjusted and the adjustments which can be electrically controlled are

- Longitudinal
- Height
- Inclination
- And folding of the backrest

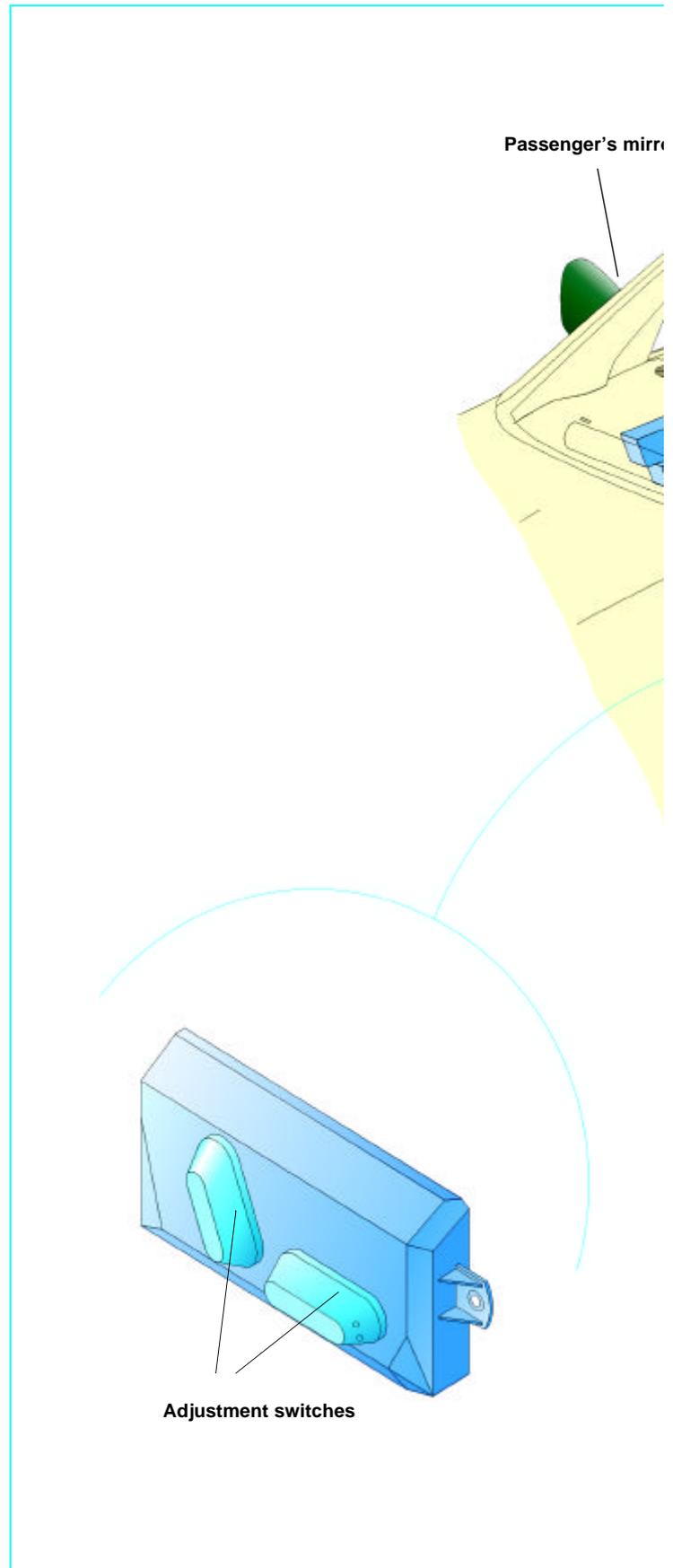
The adjustment switches, located on the side of the seats are used to select these movements. These switches directly control the supply and polarity of the voltage to four electric motors, designed to provide the different positions of the seat.

The **driver seat** has the same degree of movement as the passenger seat, since it uses very similar motors, and it is also fitted with **electronic management** to carry out the following:

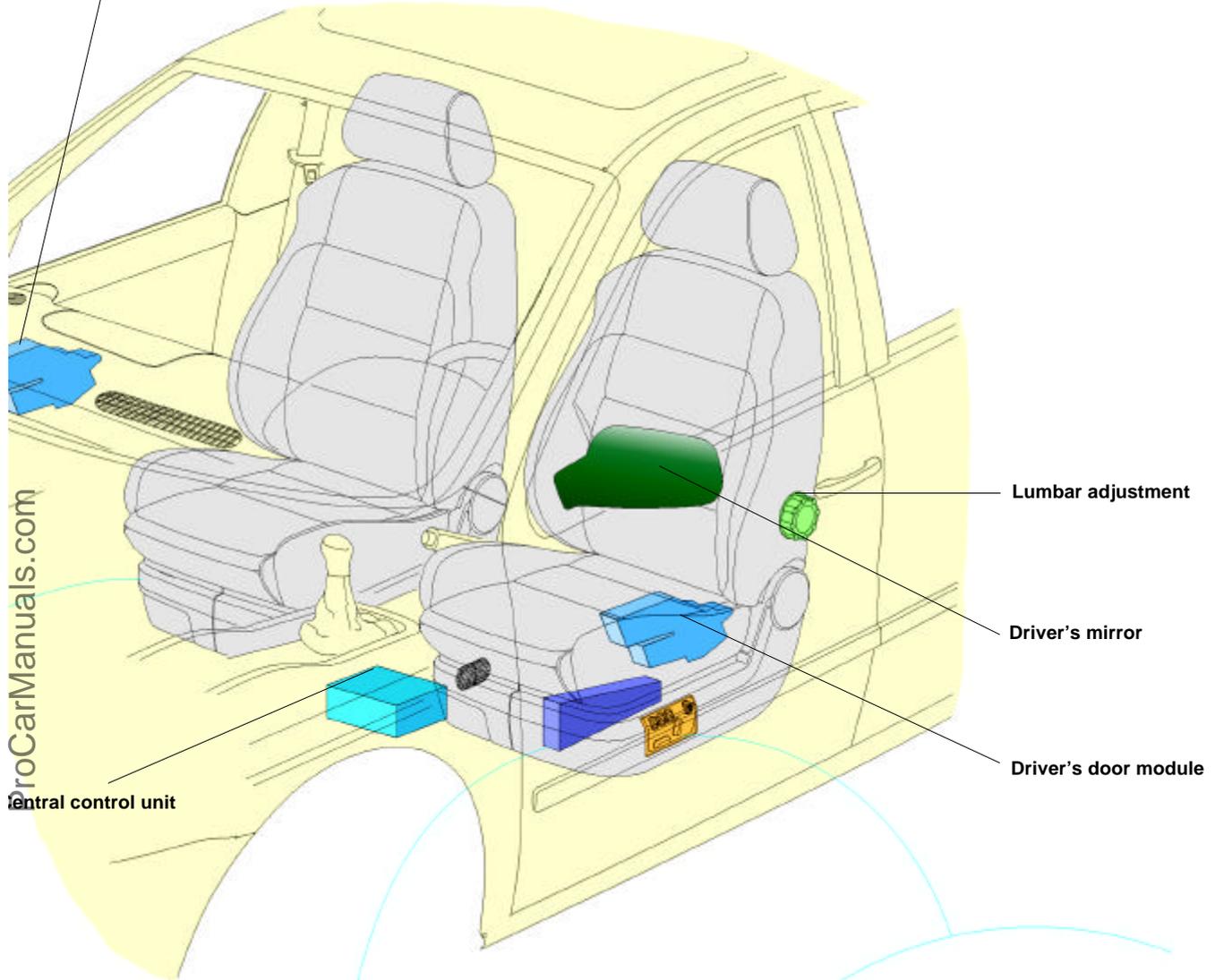
- Adjustments of the seat position which are carried out by the control unit based on the information received from the operating unit.
- Memorisation of the three seat positions and the external mirror setting.
- The assignation of a remote control for each memory, to recover the memorised position.
- The setting of the right hand mirror in a fixed position, which can be recovered when reverse gear is engaged.
- The autodiagnosis which memorises faults and displays the system operating modes.

The driver seat uses parts from the **comfort system** and for this reason both are related.

Both seats are fitted with lumbar adjustment, but this is always manual.



Passenger's door module

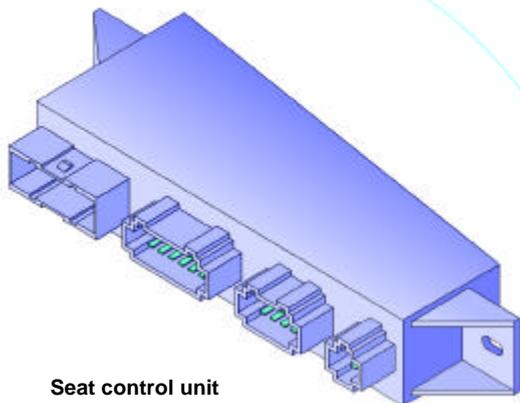


Lumbar adjustment

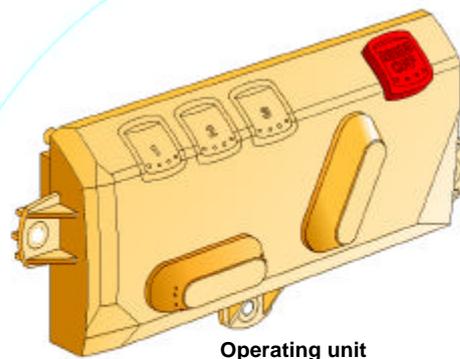
Driver's mirror

Driver's door module

Central control unit



Seat control unit



Operating unit

D64-01

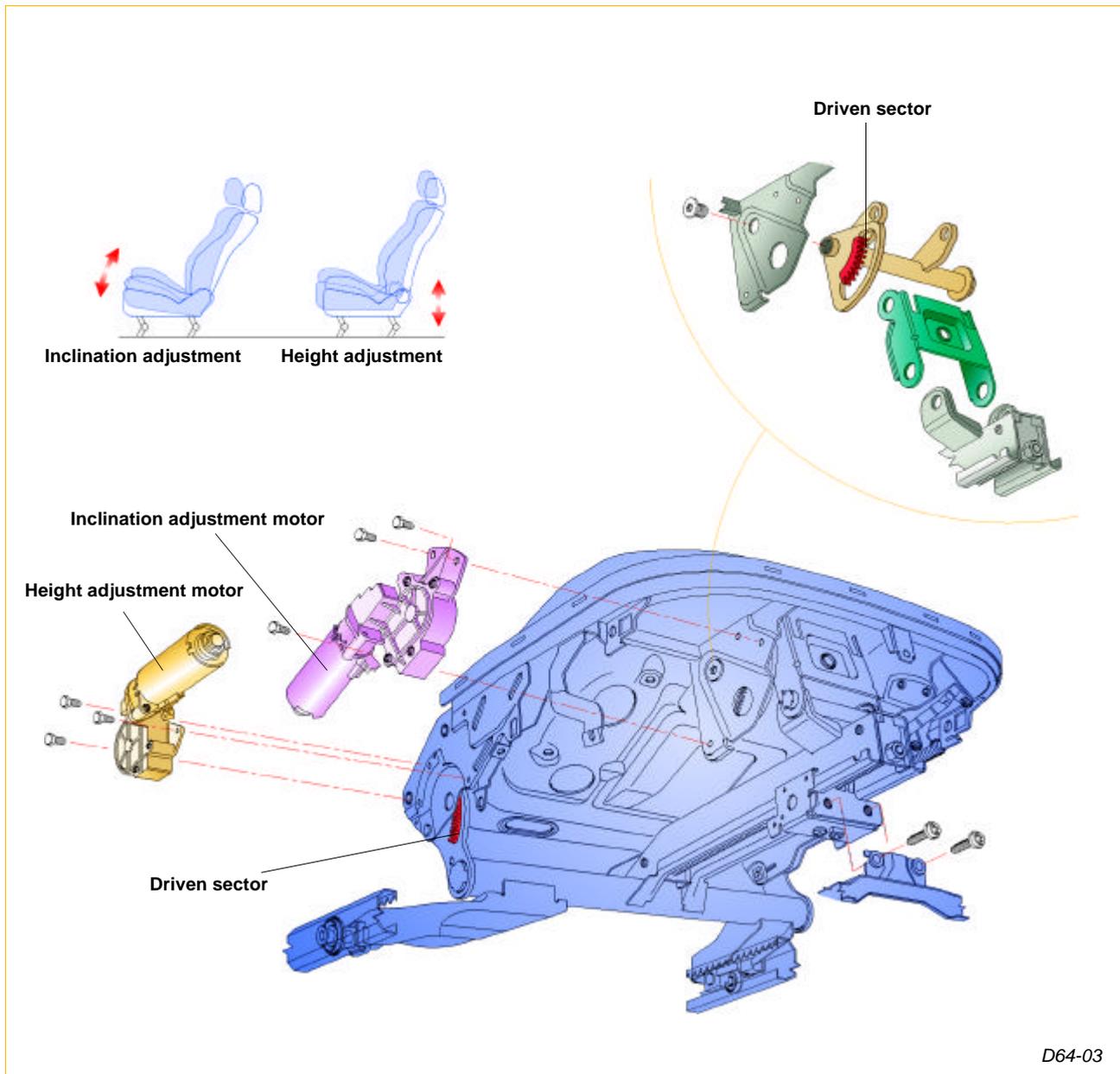
# MECHANICAL COMPONENTS

The rotation of the electric motors ensure that the different positions of the seat are achieved, using an assembly of mechanical parts, which **transform** the rotation into adequate **movements** for seat adjustment.

Both the driver seat and the passenger seat have the same mechanical parts fitted in order to achieve these adjustments.

The mechanisms which take part in the cushion inclination, height and seat longitudinal adjustments are located in the seat cushion, whereas those used for folding are located in the backrest itself.





D64-03

## ***INCLINATION ADJUSTMENT***

This adjustment is done by one of the motors located in the cushion, when it is energised, it causes several connecting plates to move, thus modifying the height.

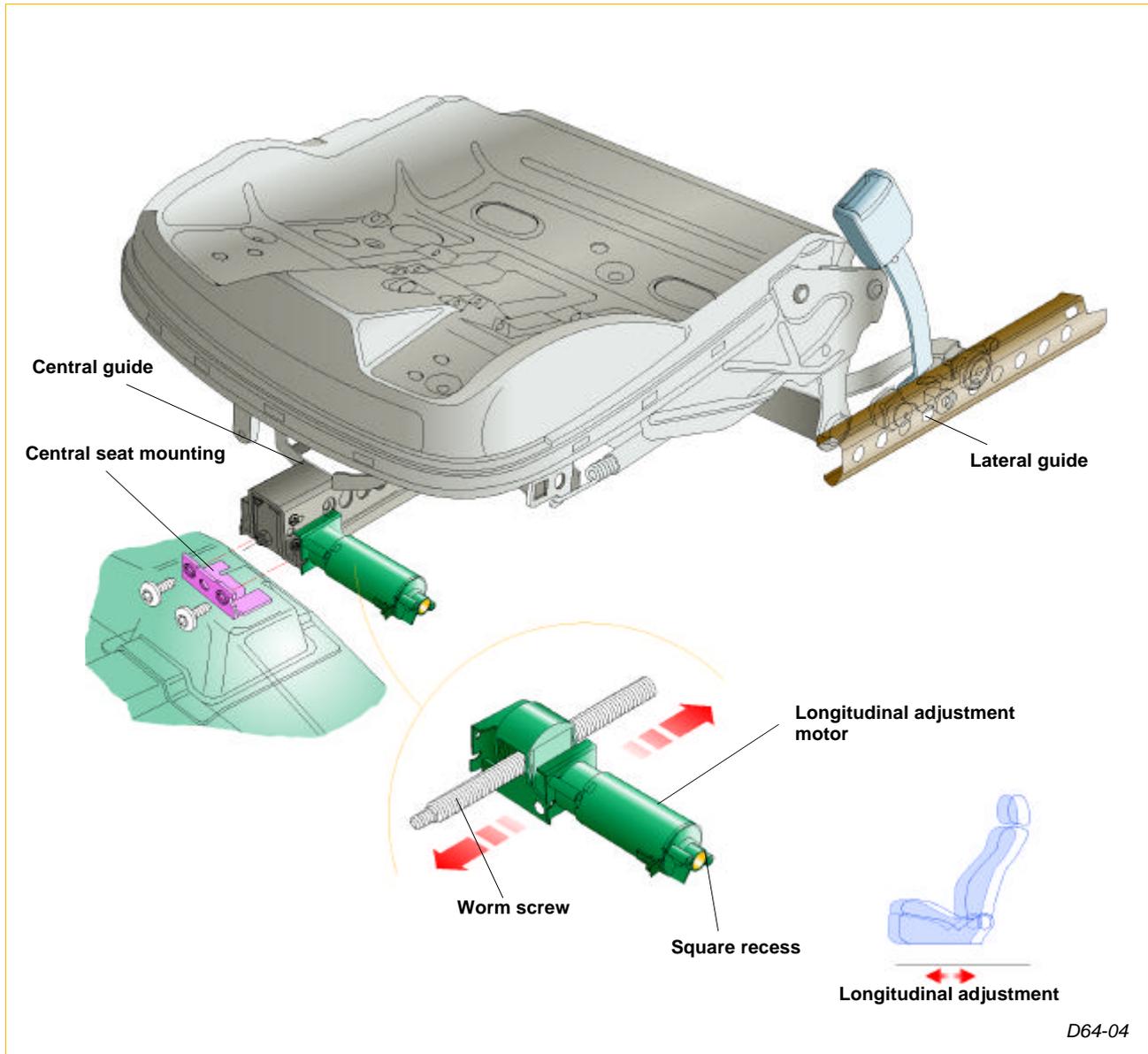
The motor has a driving pinion which acts on a definite **driven sector**, this sector forms part of a **connecting plate**. When the pinion rotates, the corresponding connecting plate tilts, and the height of this area changes. At this time, the

other motor is not energised and therefore remains immobile.

## ***HEIGHT ADJUSTMENT***

This consists in energising the rear cushion motor, thus maintaining constant seat inclination and only changing the height.

# MECHANICAL COMPONENTS



## LONGITUDINAL ADJUSTMENT

The longitudinal adjustment of the seat is done by using one single electric motor, this is attached to the body at the same point as the central seat rail.

A **threaded shaft** runs along the interior of the seat guide and is joined to the seat at both ends.

When current is supplied to the motor, the drive pinion turns, this rotates the **threaded**

**shaft** clockwise or anticlockwise. Since the motor is fixed to the body, it is the shaft which moves and it takes the entire seat along with it.

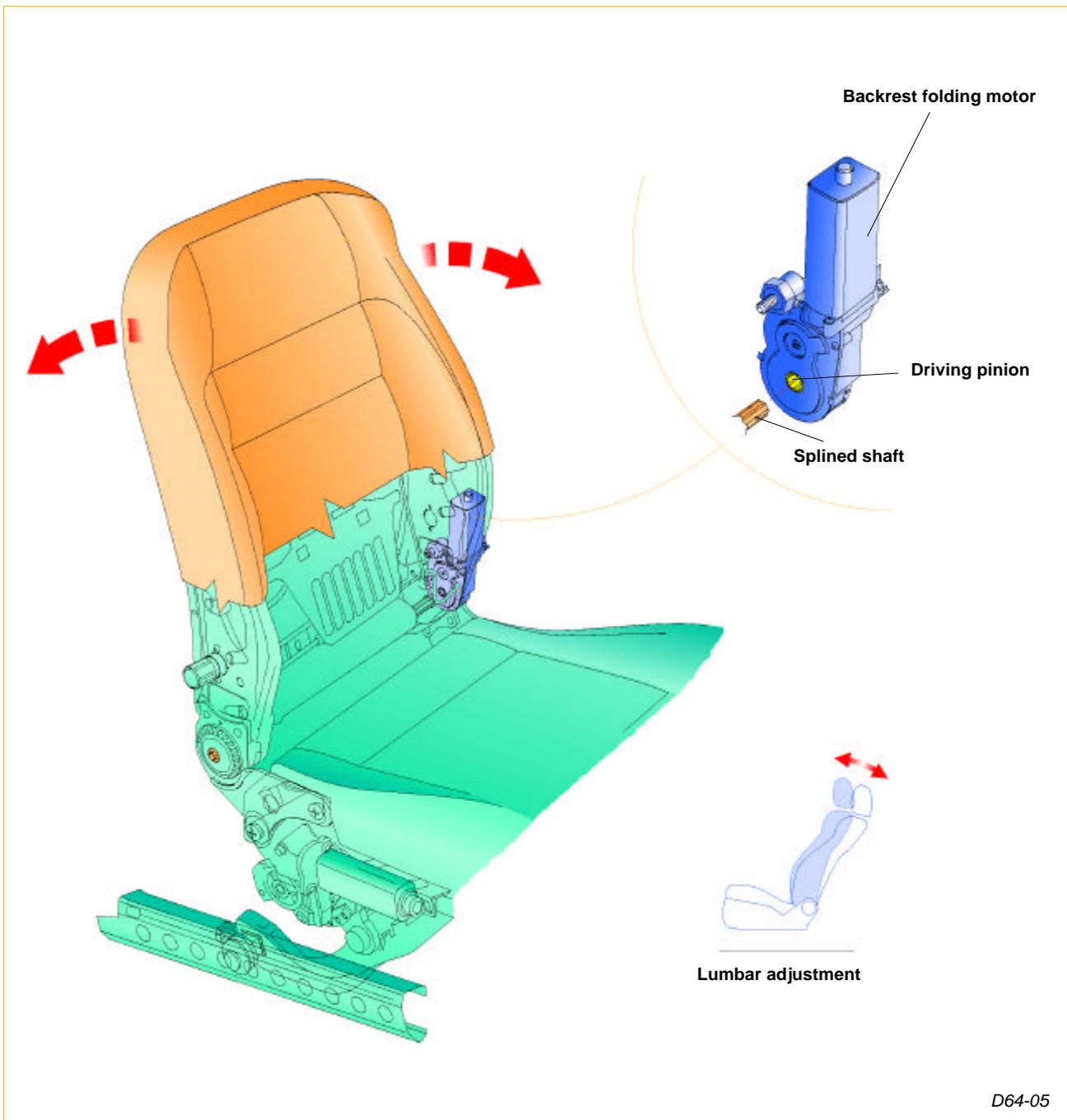
The free end of the motor shaft has a square recess, which can be rotated to vary the longitudinal position of the seat in case of motor failure.

## BACKREST FOLDING

The motor responsible for this action is bolted to the inside of the seat backrest frame.

The **splined shaft** crosses the backrest frame and it is joined to the seat cushion by two plates.

When the electric motor is energised, its drive pinion acts on the splined shaft, causing the motor to rotate and carry the backrest along with it.

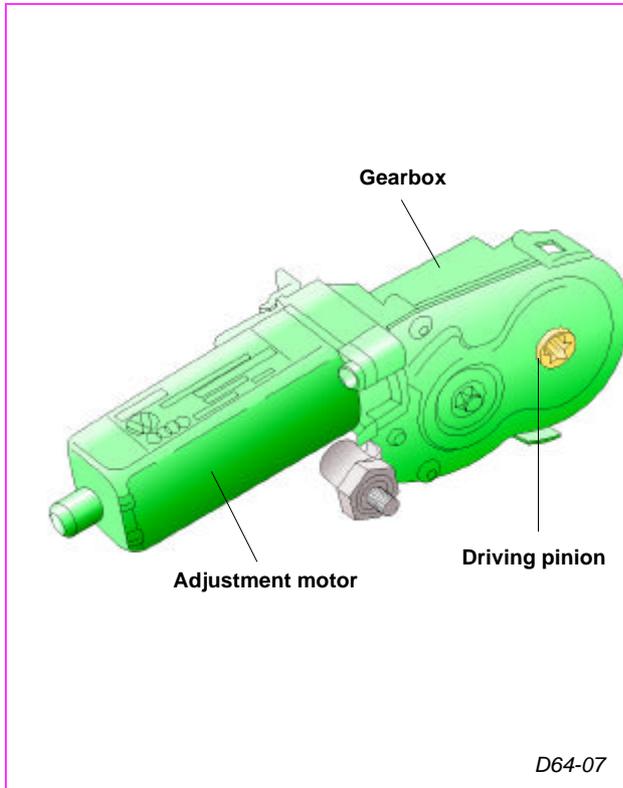
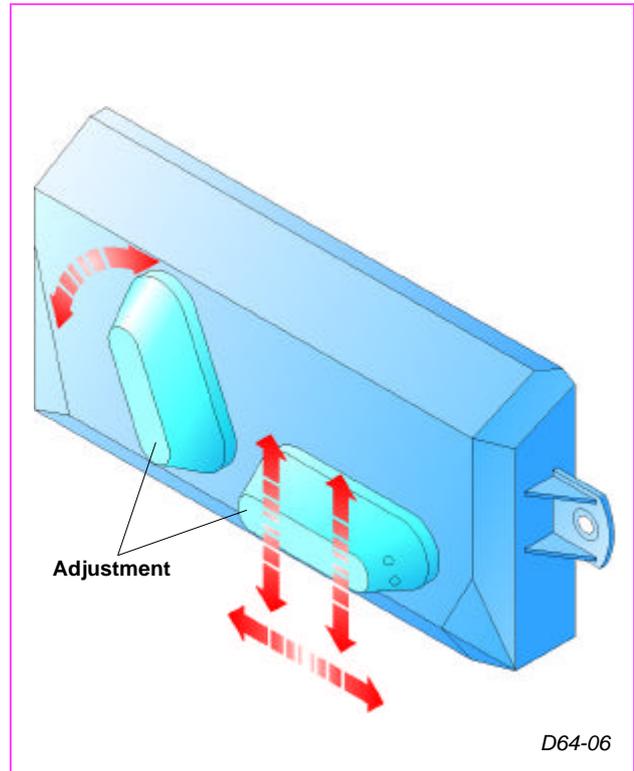


# PASSENGER SEAT

## ADJUSTMENT SWITCHES

These are operated directly by the passenger and they are used to position the seat. They are located on the external side of the seat.

Internally they are composed of four **double switches** and each one is responsible for supplying and controlling the polarity of one adjustment motor. When the switches are in the at rest position, they pass earth to the motor through both supply wires.



## ADJUSTMENT MOTORS

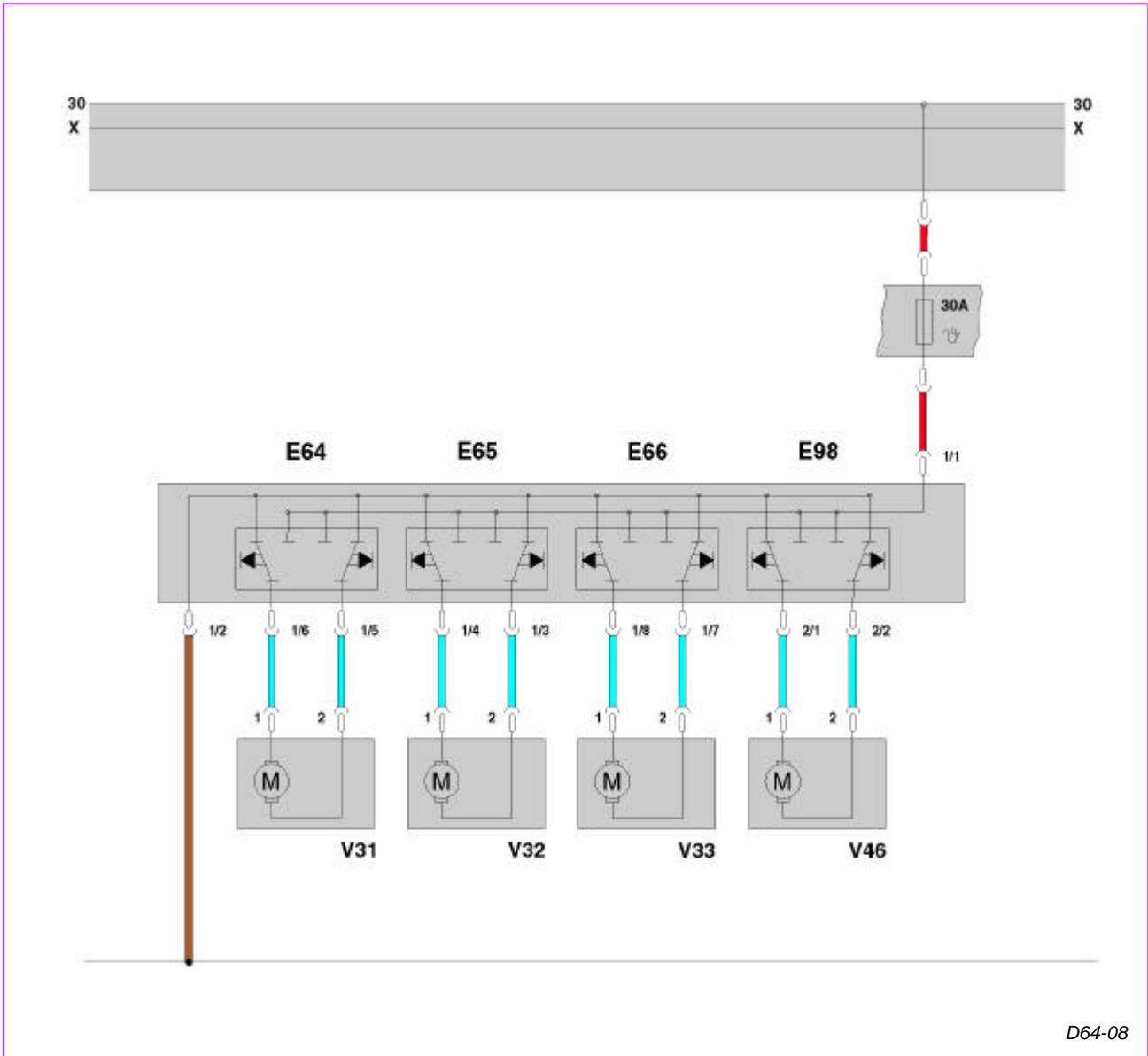
These are free rotation **direct current** motors. Each motor is controlled by an adjustment switch, which supplies positive to the motor through one of the wires and earth through the other one.

When the motor is no longer energised, this will receive earth through both wires, thus avoiding inertia movement, caused by autoinduced current when the supply is cut off.

There are three motors located in the seat cushion and these create the following movements: longitudinal (V37), inclination (V32) and height (V37). The fourth motor (V46) located in the seat backrest, is responsible for folding this part.

The motors are fitted with internal reduction gears, in order to increase torque and improve the movement precision of the driving pinion. The motors and gears make up an assembly which it is not possible to repair.

# FUNCTIONAL WIRNG DIAGRAM



D64-08

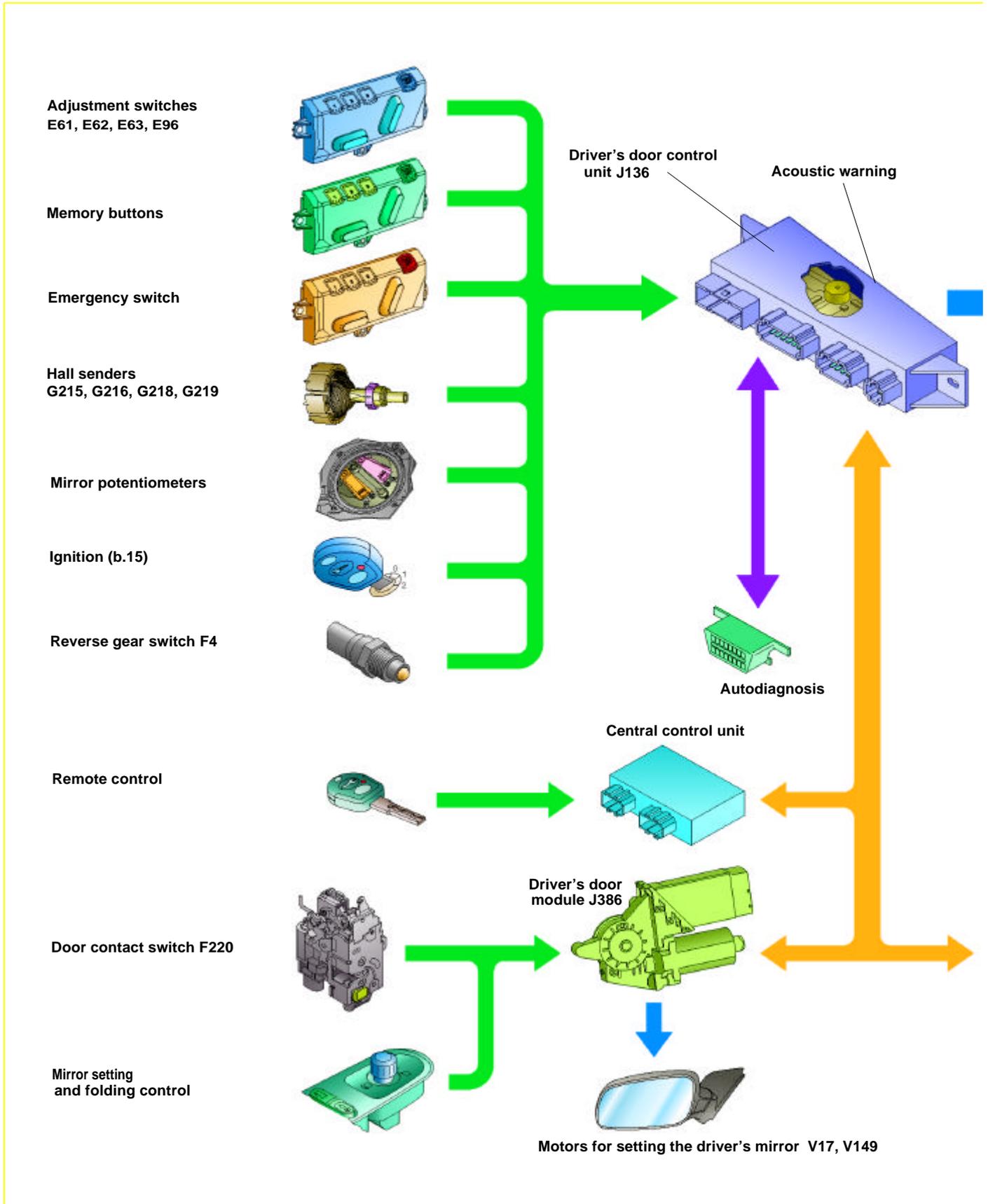
## COLOUR CODING

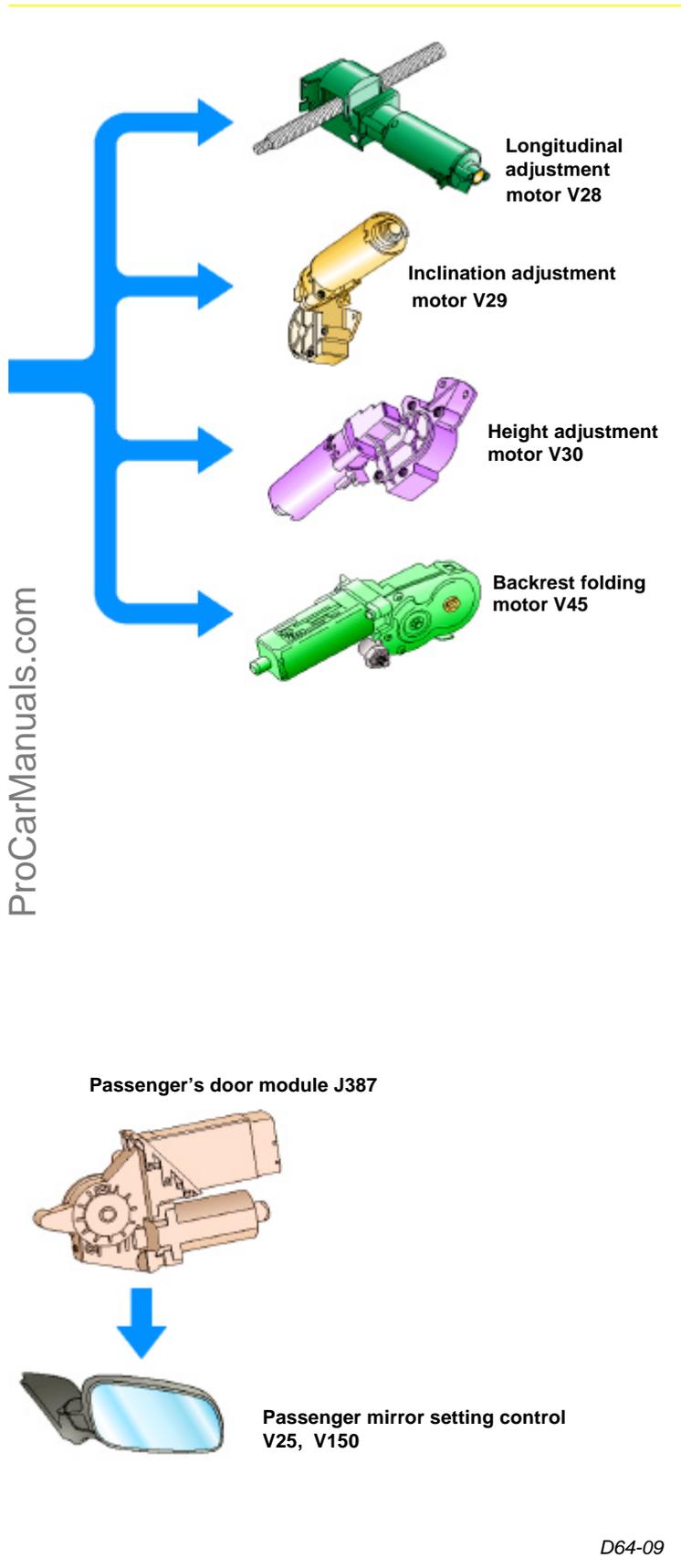
	Green	Input signal
	Blue	Output signal
	Red	Positive
	Brown	Earth

## LEGEND

<b>E64</b>	Longitudinal adjustment switch.
<b>E65</b>	Inclination adjustment switch.
<b>E66</b>	Height adjustment switch.
<b>E98</b>	Backrest adjustment switch.
<b>S</b>	Thermal fuse.
<b>V31</b>	Longitudinal adjustment motor.
<b>V32</b>	Inclination adjustment motor.
<b>V33</b>	Height adjustment motor.
<b>V46</b>	Backrest adjustment motor.

# SYNOPTIC CHART





In the following pages we will deal exclusively with the electric seat provided with a memory function and only available for the driver's seat.

The electronic management of the seat with memory needs two types of signal, one which it gets directly from the CAN-Bus line and the other directly from the sensors.

The sensors which send **signals directly** to the control unit are:

- Adjustment switches.
- Memory buttons.
- Emergency switch.
- Hall senders for the seat motors.
- Potentiometers for the external mirror setting motors.
- Signal LI from ignition (Terminal 15).
- Reverse gear switch.

The signals received from the **CAN-Bus line** are:

- Recognition of the remote control used to release the central locking.
- Driver's door opening.
- Position of the control for the setting and folding of the mirrors.

When the data has been processed, the control unit will directly manage the energising of the driver's seat motors. It will also inform the front door control units as to what external mirror motors should be energised.

The **functions assumed** by the management of the electric seats with memory are:

- Position adjustment.
- Position Memorisation.
- Memory recovery.
- Memorisation of reverse gear.
- Autodiagnosis.

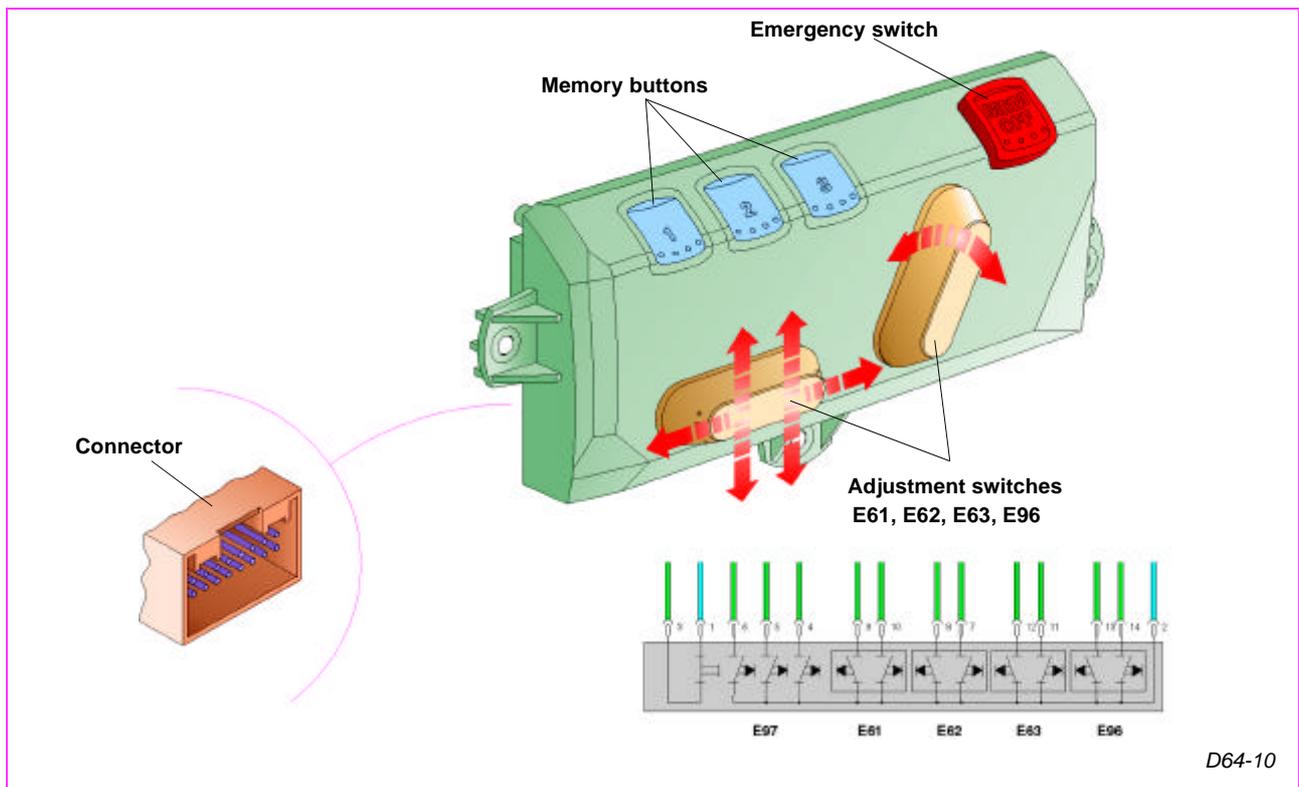
**Note:** Consult the Self Study Program No. 65 "Comfort system", for more information on the CAN-Bus line.:

# SENSORS - ACTUATORS

## OPERATING UNIT

This unit is used to adjust the position of the seat, and it also memorises and recovers the position of the seat and the mirrors.

It is composed of several parts: the adjustment switches, the memory buttons and the emergency switch.



### ADJUSTMENT SWITCHES

Internally these are made up of four switches (E61, E62, E63, E96), open in the at rest position: When they are closed they allow negative current to pass to the control unit through different terminals.

#### SIGNAL APPLICATION

This is used by the control unit to **adjust the seat**, since it determines which motor should be energised and in what direction it should rotate.

### MEMORY BUTTONS

These are three switches which remain open in the at rest position. If pressure is maintained on these switches, they will close the circuit and allow earth to pass to the control unit.

### SIGNAL APPLICATION

The control unit uses these signals to **memorise** and **recover** the seat and mirror positions.

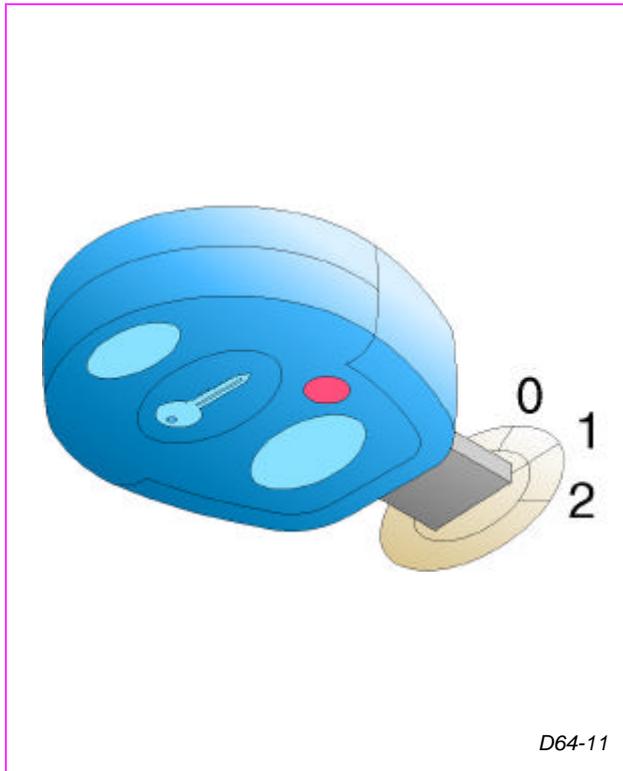
### EMERGENCY SWITCH

This has two positions, which are selected when the switch is pushed; in the lower position, the switch is closed, thus passing positive to the control unit; in the upper position, the switch is open.

#### SIGNAL APPLICATION

The memorisation and recovery of setting positions is only possible when the switch is in the lower position (closed).

If the switch is pushed (open) during the recovery of a memory setting, the seat movement will stop and can then only be adjusted using the adjustment switches. This is to **prevent involuntary movements**.



D64-11

### **IGNITION SWITCH (TERMINAL 15)**

The control unit analyses the situation of the ignition to determine if a position is intended to be memorised or recovered when a memory button is pressed.

#### **SIGNAL APPLICATION**

The control unit can only **memorise** the position if the ignition is switched on.

When the ignition is switched off, the control unit allows the memorised position of the seat and the mirrors to be **recovered**, regardless of whether this is selected using the buttons or the remote control.

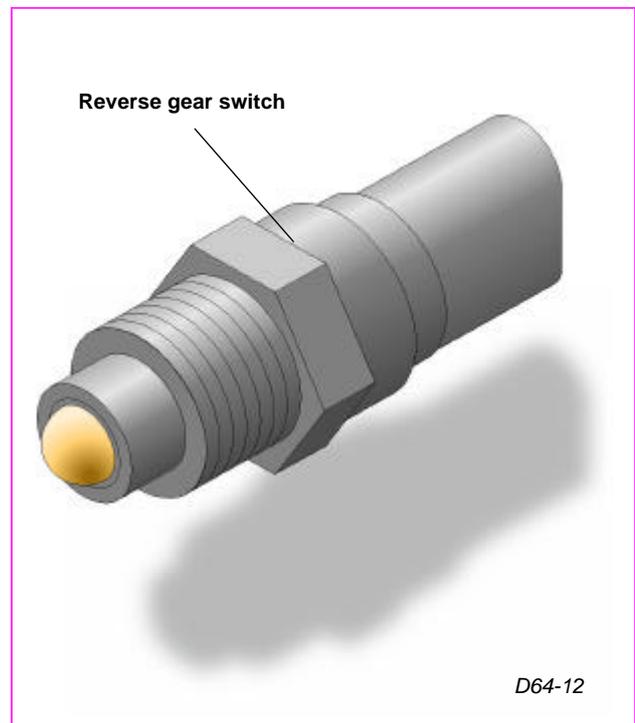
### **REVERSE GEAR SWITCH F4**

This is the same as that which controls the reversing lights and is located in the gearbox. The switch remains open in the at rest position and it is closed when the reverse gear is engaged, allowing a 12V signal to pass.

#### **SIGNAL APPLICATION**

The control unit uses this signal to determine when the right mirror should be set in the position for reversing.

**Note:** On vehicles with automatic gearbox, this signal comes from the lock relay.



D64-12

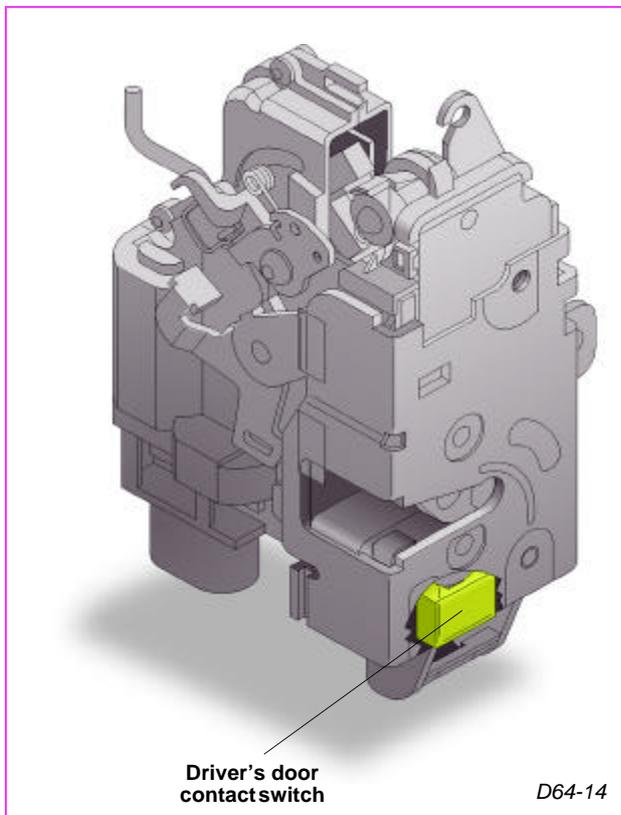
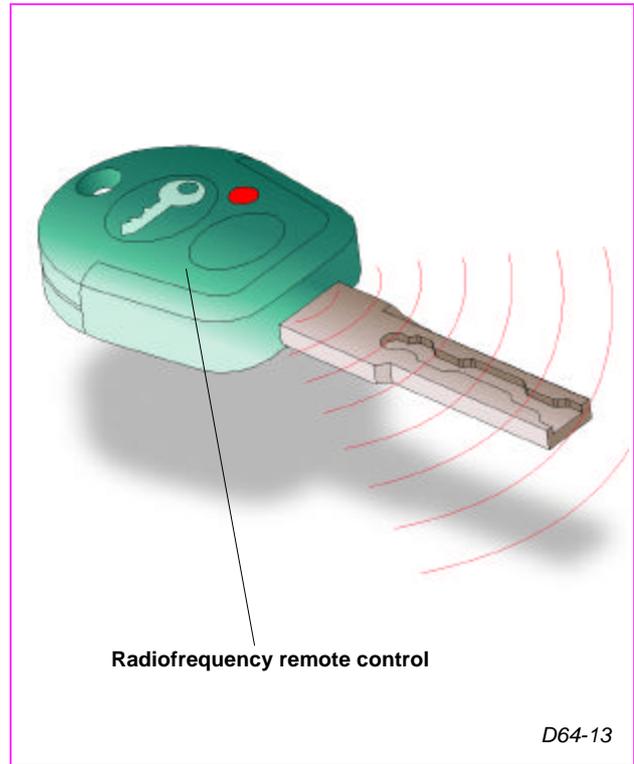
# SENSORS - ACTUATORS

## REMOTE CONTROL

This is a radiofrequency emitter whose signal is captured by the aerial located in the A pillar. This signal is processed by the comfort system central control unit which then passes it to the CAN-Bus line.

## SIGNAL APPLICATION

The seat control unit collects the remote control data from the CAN-Bus line. This data is used to **recover the seat position** associated with this remote control when unlocking.



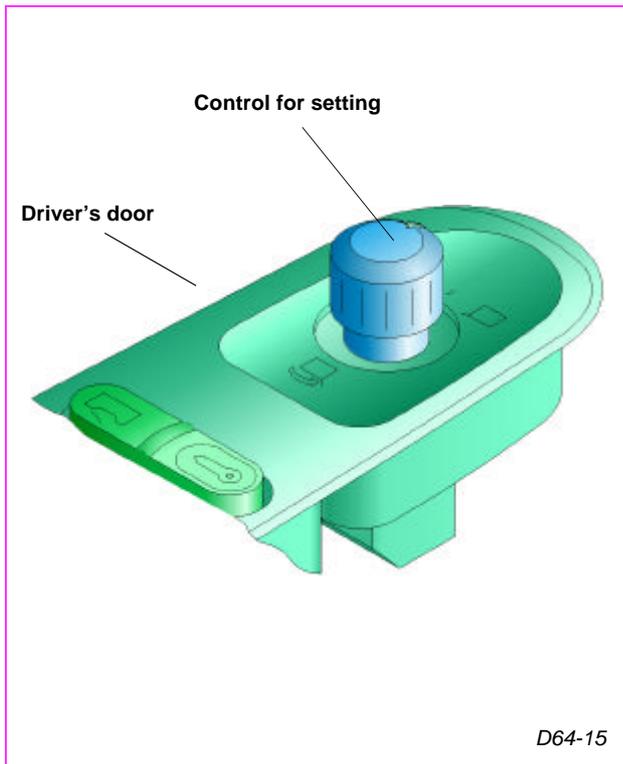
## DRIVER'S DOOR CONTACT SWITCH

This is located in the driver's door actuator (F220) and it is operated by the lock latch.

The switch remains closed when the door is opened, sending its signal to the driver's door module, from where it is passed to the CAN-Bus line and collected from here by the seat control unit.

## SIGNAL APPLICATION

This signal is needed to differentiate the memorised positions which should be recovered by the control unit.



## MIRROR SETTING AND FOLDING CONTROL

This control (E48) is used to select the mirror setting and folding action.

When the control is operated, it sends electrical signals to the driver's door control unit, indicating the operation selected.

The data from this control is passed in message format by the door control unit to the CAN-Bus line.

### SIGNAL APPLICATION

The seat control unit collects this data, which indicates that the right hand mirror has been selected, and uses it to memorise and recover the **position** of the right hand mirror when the **reverse gear** is selected.

## ACOUSTIC WARNING

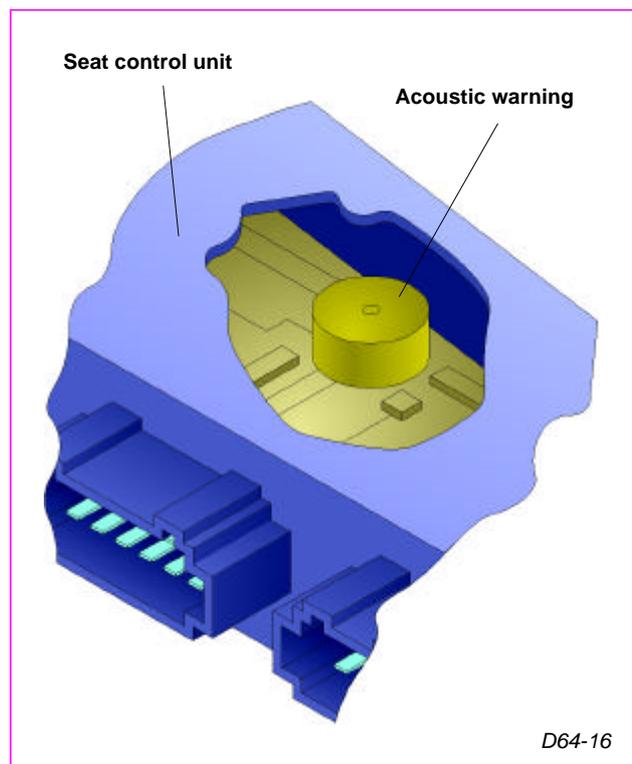
This is located within the seat control unit and cannot be repaired or replaced.

This unit is governed by the control unit electronic circuit.

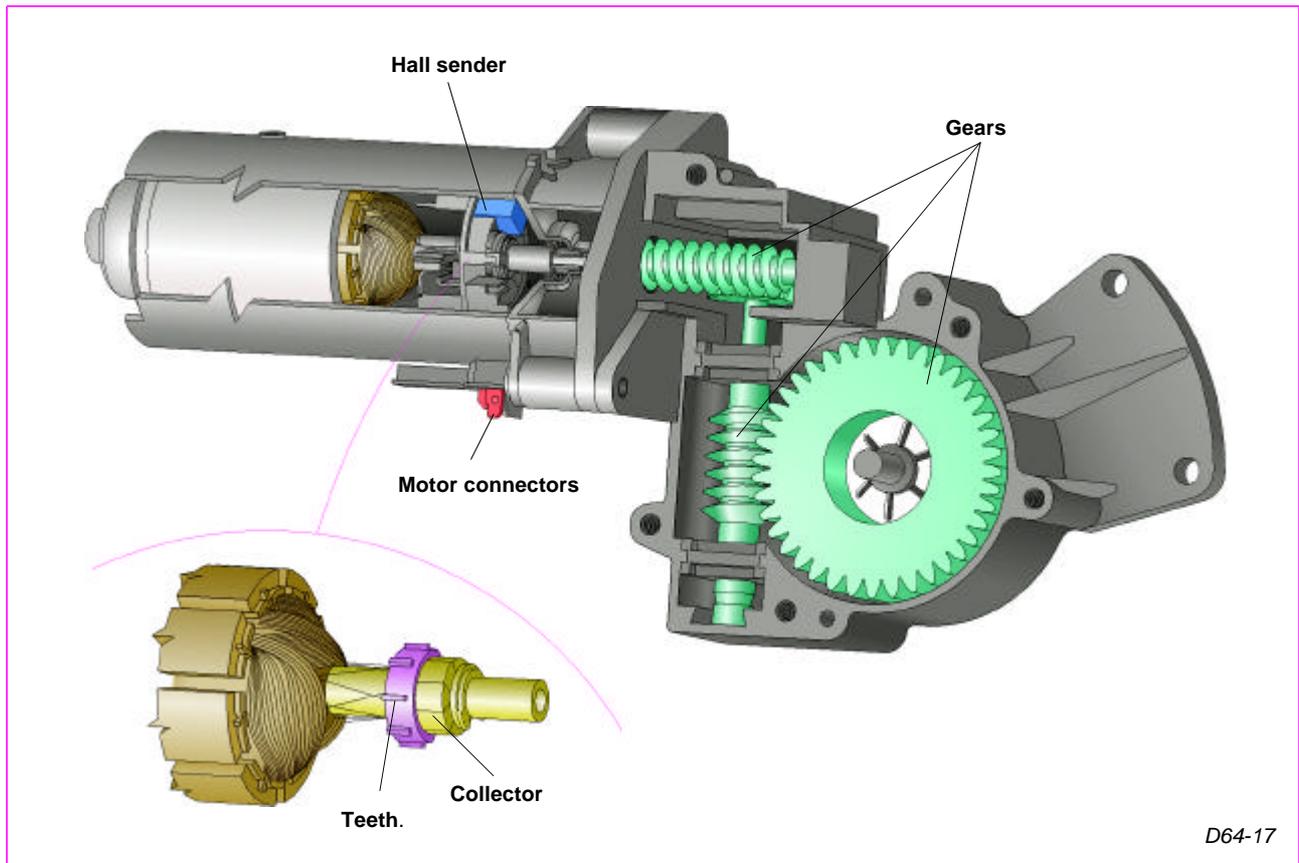
### SIGNAL APPLICATION

The acoustic warning **confirms** that the operation requested has been carried out correctly.

This warning is sounded when the seat positions are memorised, when any of these positions are associated with a remote control, and when the setting of the right hand mirror is programmed for reversing.



# SENSORS - ACTUATORS



## ADJUSTMENT MOTORS

The operation of the four motors on the driver's seat is identical to those of the passenger's seat.

The motors can be used in combination to adjust the length (V28), the height and inclination of the cushion (V29 & V30), as well as the folding down of the seat backrest (V45).

In case of failure, it will not be possible to make the adjustment corresponding to the faulty motor, except in the case of the longitudinal motor.

## ENERGISING

The motors are always energised by the **control unit** with battery voltage, regardless of whether the adjustment is made by the adjustment switches or from a memorised setting.

The power is supplied for a maximum of 20 seconds; the motors can be energised again if the corresponding switch is operated.

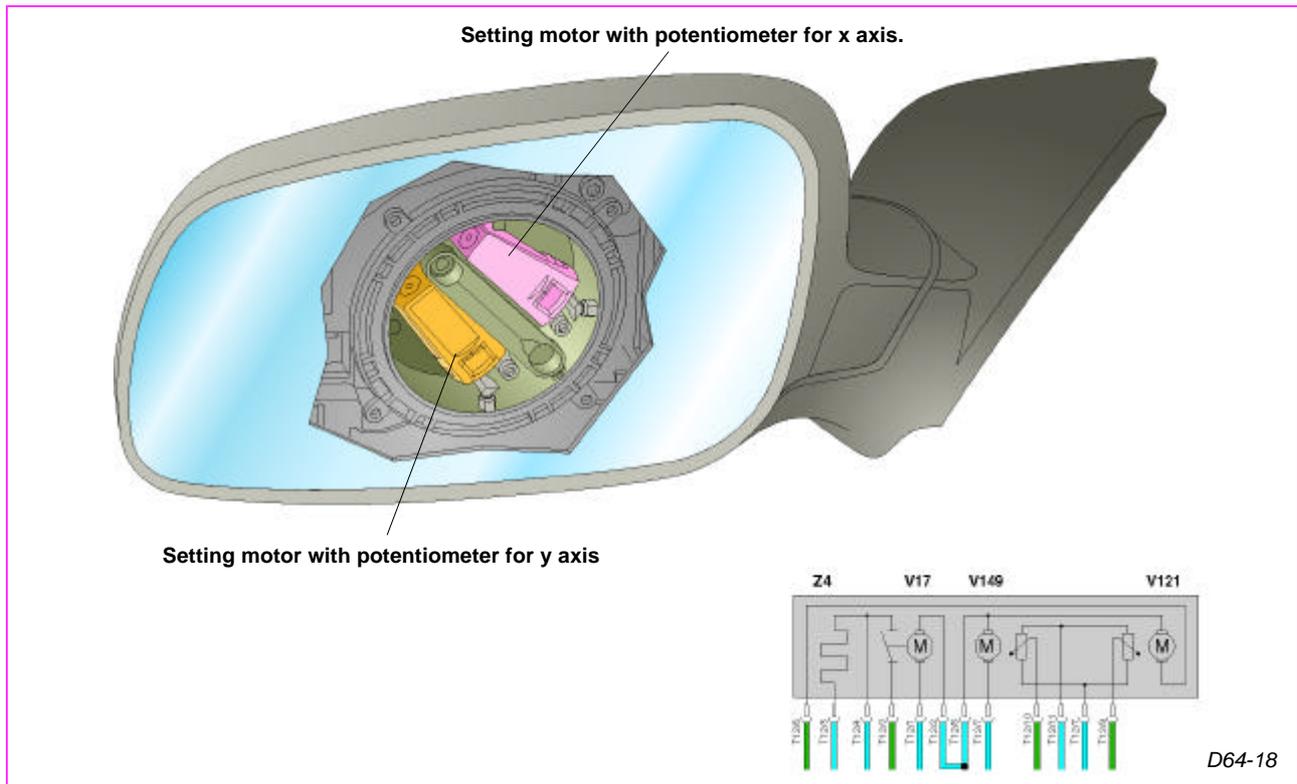
## HALL SENDERS

These are integrated in the motors and are composed of one single part, they can be found in the longitudinal adjustment motor (G215), in the inclination adjustment motor (G216) and in the height adjustment motor (G218) and also in the motor used for folding the seat backrest (G219).

They have a toothed crown wheel with 8 teeth, forming part of the rotor and a hall element which is part of an integrated circuit. This circuit is supplied with earth and 5 V by the seat control unit. The hall sender emits a square waveform (between 0 and 5V), so that for each engine rotation, 8 pulses are generated.

## SIGNAL APPLICATION

The control unit registers the impulses of each sender in its internal counter, and this enables it to identify the **instantaneous position** of each motor.



## MIRROR POTENTIOMETERS

When the vehicle is fitted with electric mirrors, each mirror has two single track potentiometers, joined to the setting motors for the mirror: One of these is for the vertical setting motor and the other is for the horizontal setting motor.

The potentiometers work as voltage dividers, and for this reason they are supplied with 0 and 5V by the seat control unit. During displacement, the pointer moves along the resistance track and modifies the output voltage going to the control unit.

## SIGNAL APPLICATION

These signals are used by the seat control unit to determine the **instantaneous position** of each mirror setting motor.

## SETTING MOTORS

The setting of each mirror is achieved by the action of two free rotating direct current motors.

One motor (V17 - V25) adjusts the position of the "y axis", moving it to the left with (+) and to the right with (-). Another motor (V149 - V150) adjusts the "x axis", moving it up with (+) and down with (-).

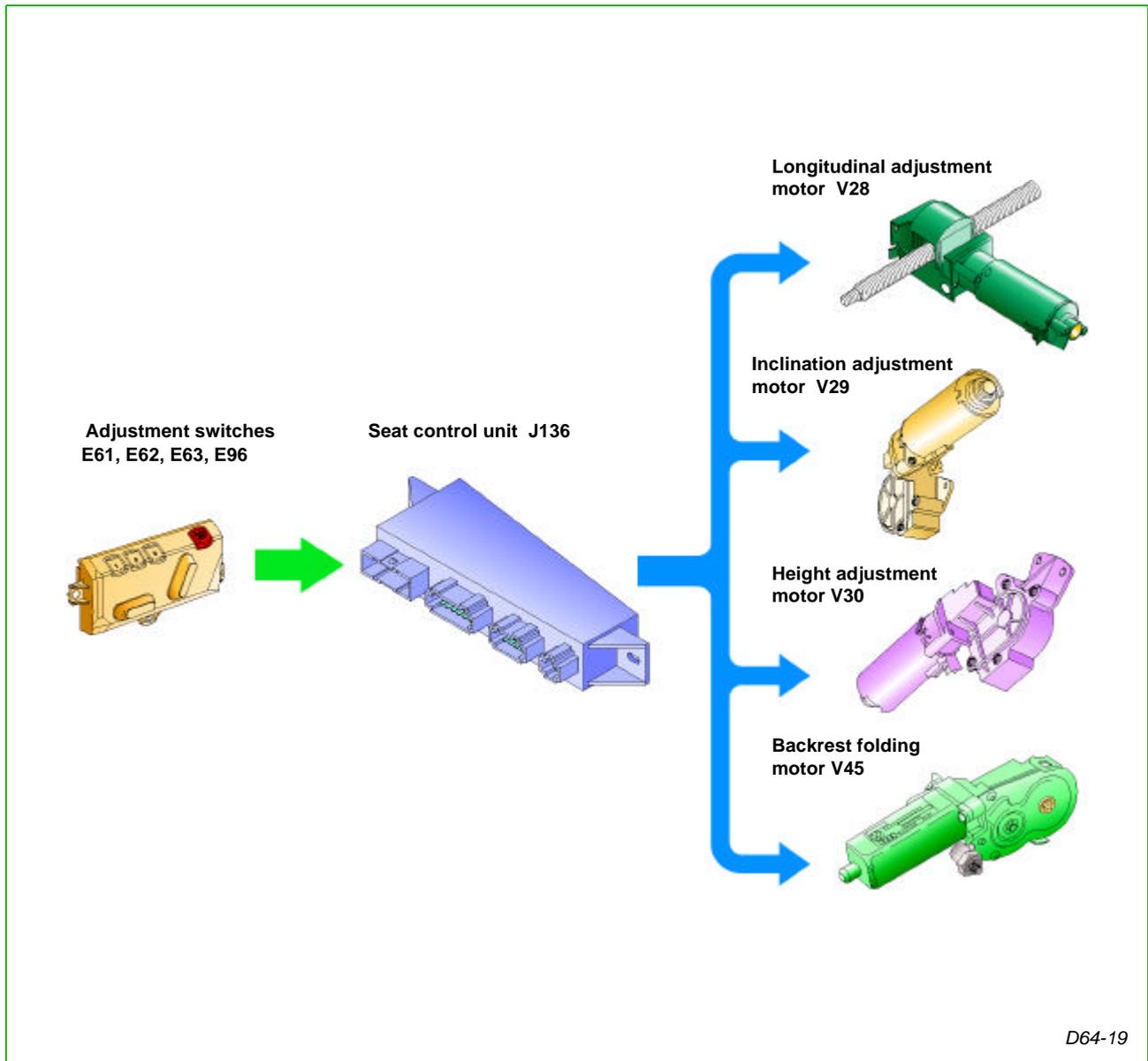
## ENERGISING

The corresponding **door control unit** is responsible for **energising** each motor, using battery voltage and controlling the adequate polarity in each case.

The **seat control unit will decide** which motor should be energised in order to achieve the memorised position; and it will then inform the door control unit through the CAN-Bus line as to which motors should be energised.

**Note:** Consult the Self Study Program No. 65 "Comfort system" for more information on the components that emit data to the CAN-Bus line.

# FUNCTIONS



D64-19

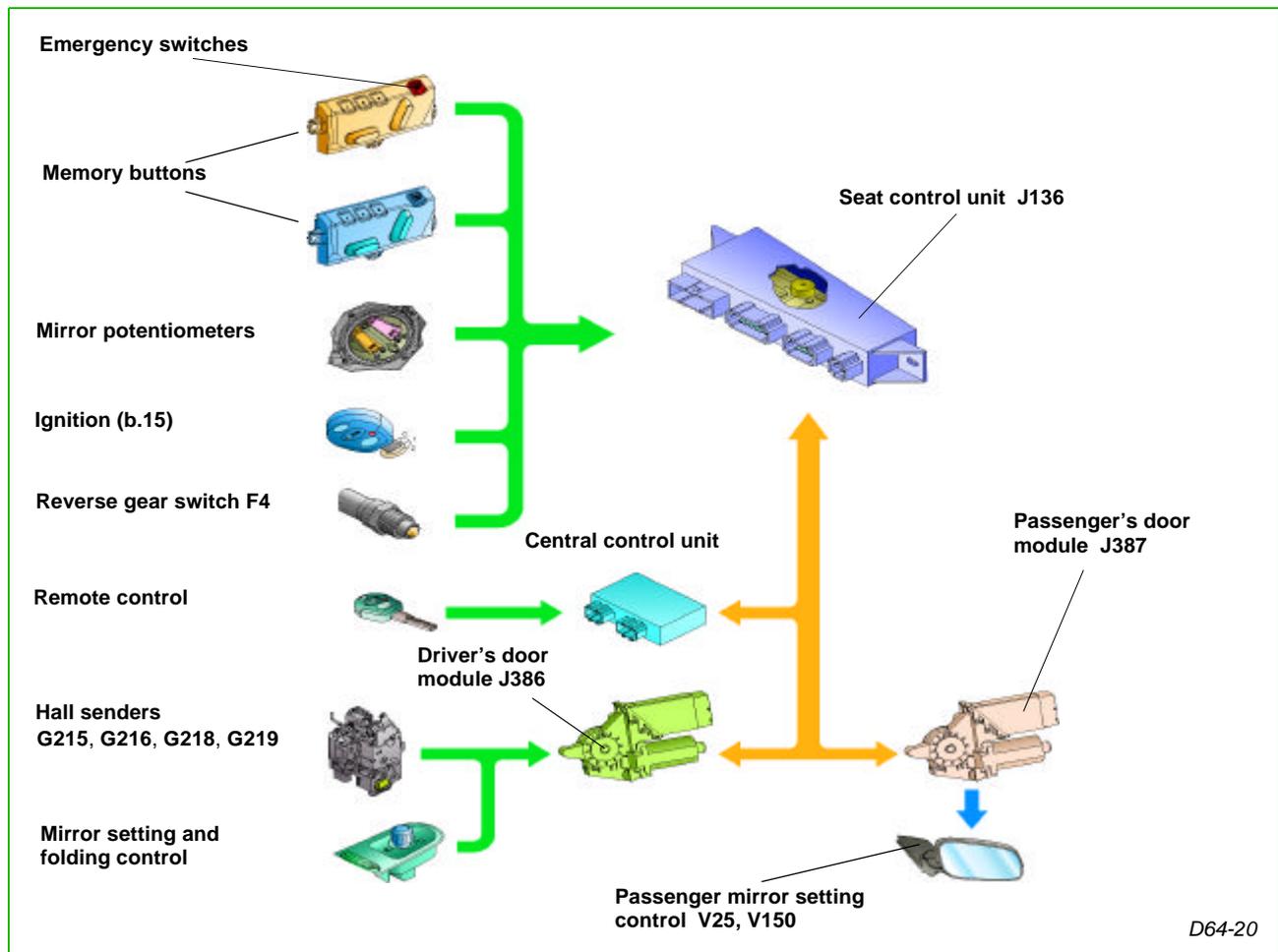
## **POSITION ADJUSTMENT**

This is achieved by acting on the adjustment switches, and the control unit is responsible for supplying the adequate polarity to the corresponding motor.

The adjustment can be made in **any situation** regardless of the situation of the driver's door, the emergency switch, and the ignition (terminal 15). However it is not advisable to make this adjustment when driving.

The control unit will only make simultaneous adjustments to the height and inclination settings; in any other case, where two motors are energised, neither will be operated.

The motors will only be energised when the battery voltage is over 9 volts, and during a maximum period of 20 seconds, to prevent damage to the motor.



## REVERSING MEMORISATION

This function enables a specific position of the right mirror to be memorised and thus facilitate manoeuvres. The mirror setting will vary when the reverse gear is engaged regardless of the position of the emergency switch.

The control unit needs the following data relating to:

- Memory buttons.
- Ignition switch (terminal 15).
- Reverse gear.
- Control for setting and folding of mirrors (signal recovered from the CAN-Bus line).

### MEMORISING

This should be done by first selecting a memorised seat position, then having switched

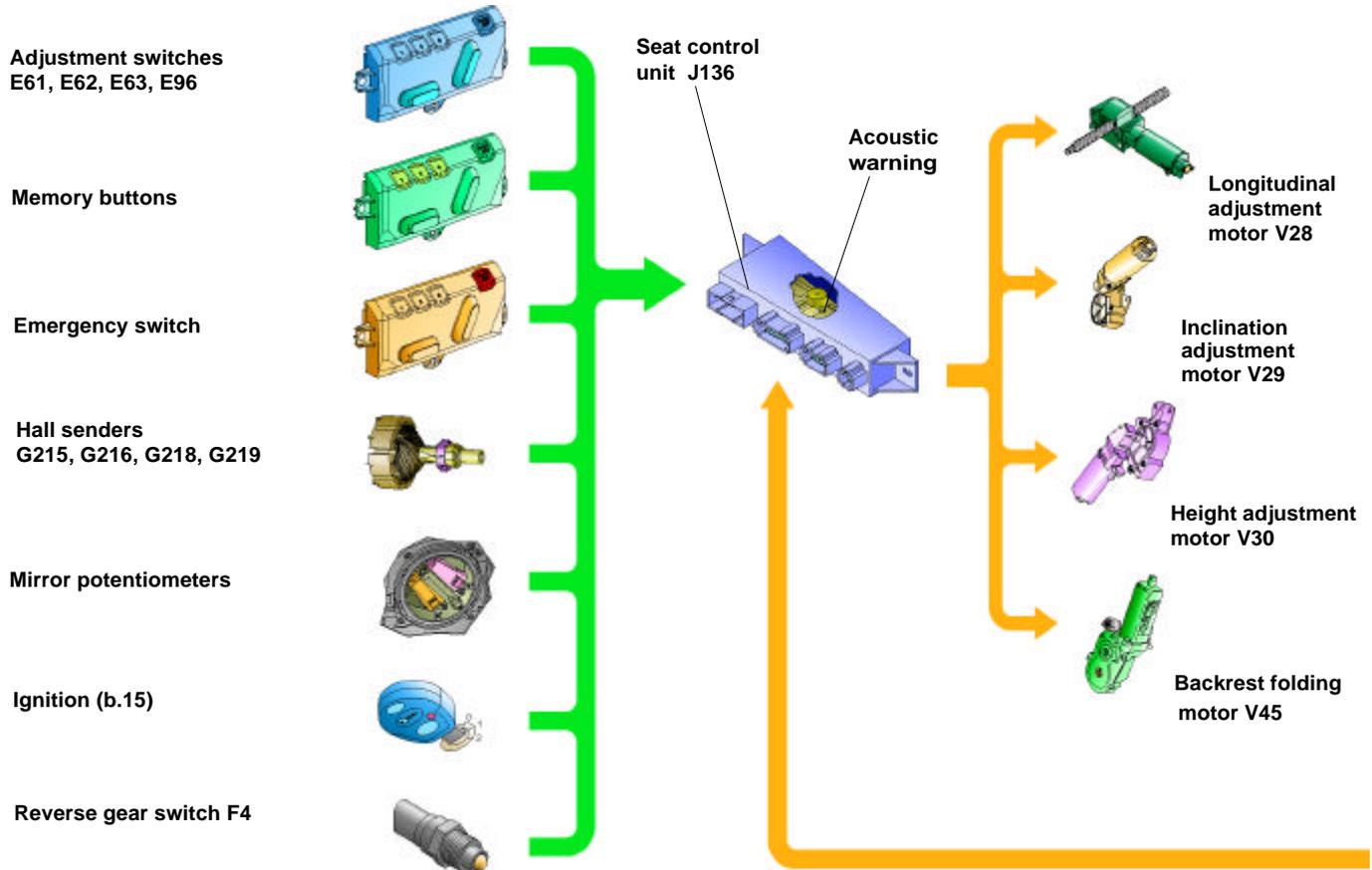
on the ignition, the reverse gear will be selected and the right hand mirror will set to the desired position. The memorisation will have finalised when the memory button where the setting is to be stored has been pressed and the acoustic confirmation signal has been heard.

### RECOVERY

It is necessary to have previously selected a memorised seat position, from this moment whenever the reverse gear is engaged and the right hand mirror is selected, the mirror will move into the memorised position or by default to the factory set position.

The mirror will return to its original position when reverse gear is disengaged.

# FUNCTIONS



## POSITION MEMORISATION

This consists in the memorisation by the seat control unit of:

- The condition of the **control unit counters**, whose value varies according to the impulses emitted by the hall senders.
- The **voltage** emitted by each mirror **potentiometer**.
- A different **remote control** for each memory.

To carry out this function, the control unit needs the signals from the following sensors:

- Emergency switch closed position.
- Ignition on.
- Hall senders.
- Adjustment switches.
- Mirror potentiometers.
- Memory buttons.
- Remote control.

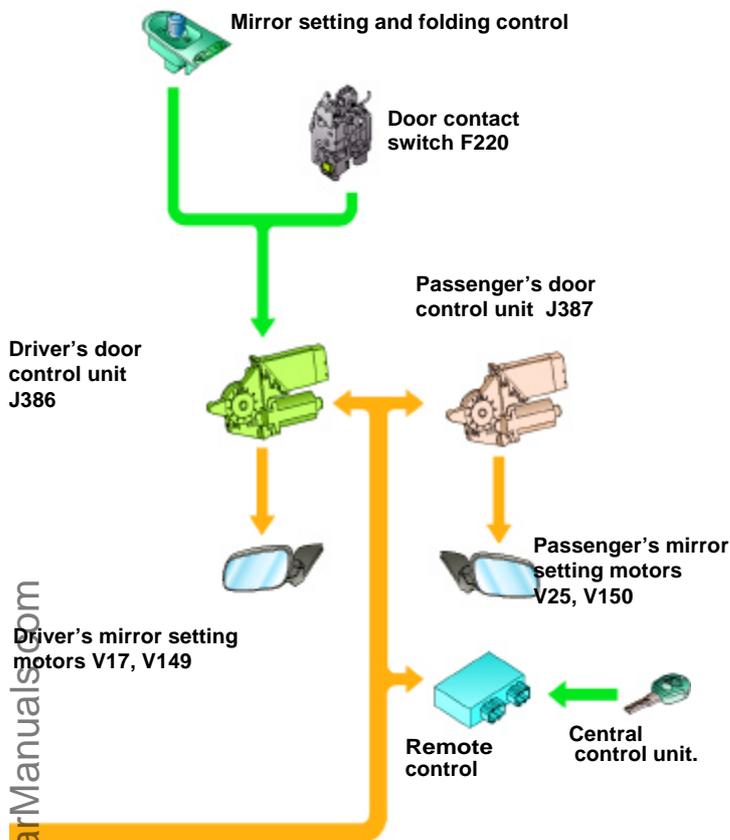
Before memorising, it is necessary to adjust the seat and the mirrors. To memorise the position, the memory button should be pressed

until the acoustic confirmation sound is heard. Then 10 seconds are available to memorise a remote control, to do this, it is sufficient to switch off the ignition and push the unlocking button of the remote control until the acoustic confirmation sound is heard.

When a new memorisation is made, the control unit will erase the previous values stored in this memory setting.

The values will also be erased when the battery is disconnected. In this case, in order to memorise, it is essential to electrically fold the backrest down completely to the front, so that the impulse counters of the control unit will adopt a value of 30000. These counters can be checked with the fault reader.

From this base initial value, their condition will increase or decrease according to the impulses emitted by the hall senders.



D64-21

**Note:** In order to memorise a remote control, it is essential that reverse gear should not be selected.

## RECOVERY OF MEMORIES

When the memory recovery has been selected, the control unit **compares** the memorised values with the present ones, checking the impulse counters as well as the voltage emitted by the potentiometers.

It will then energise the adjustment motors and at the same time emit the proper messages to the CAN-Bus line in order to set the mirrors to the memorised position.

The control unit needs to know the data relating to:

- Emergency switch
- Ignition switch.

- Driver's door contact switch.
- Hall senders.
- Mirror potentiometers.
- Memory buttons.
- Remote control.

The memorised positions can be recovered in two ways, either with the remote control or by using the memory buttons. In both cases, the emergency switch should be in the lower position (closed) and the ignition should be off.

## REMOTE CONTROL

When the doors are unlocked using the remote control, the central control unit of the comfort system sends a message to the CAN-Bus line, indicating which remote control was used.

The door control unit on the driver's side sends another message indicating a door open condition to the CAN-Bus line when the door contact switch closes.

When the seat control unit receives both messages, it adjusts the seats and sets the mirrors to the position memorised.

## MEMORY BUTTONS

There are two possibilities, depending on the situation of the driver's door.

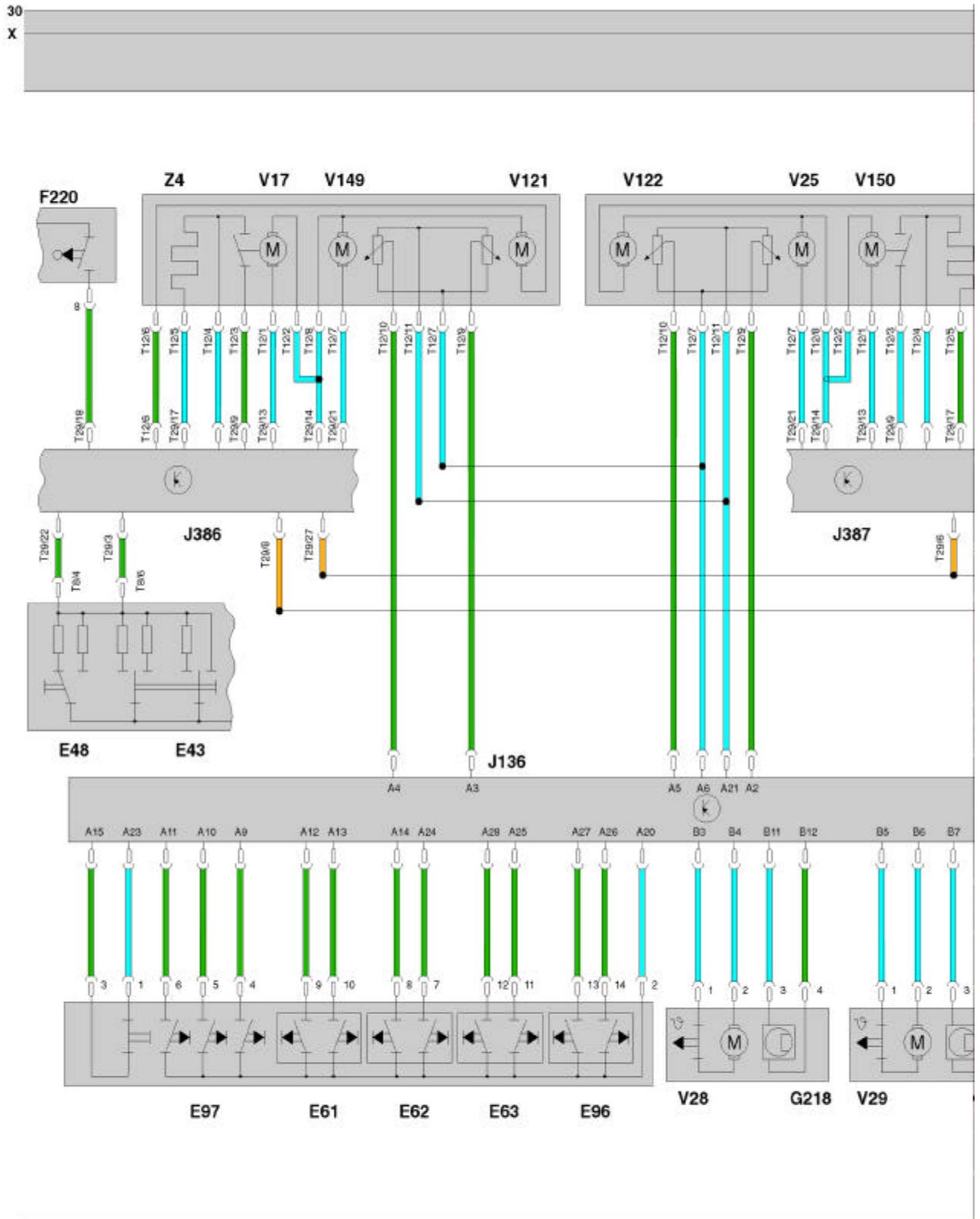
If the **door is closed**, the memory button should be held down until the desired position is reached, the movement is detained when the button is no longer pressed.

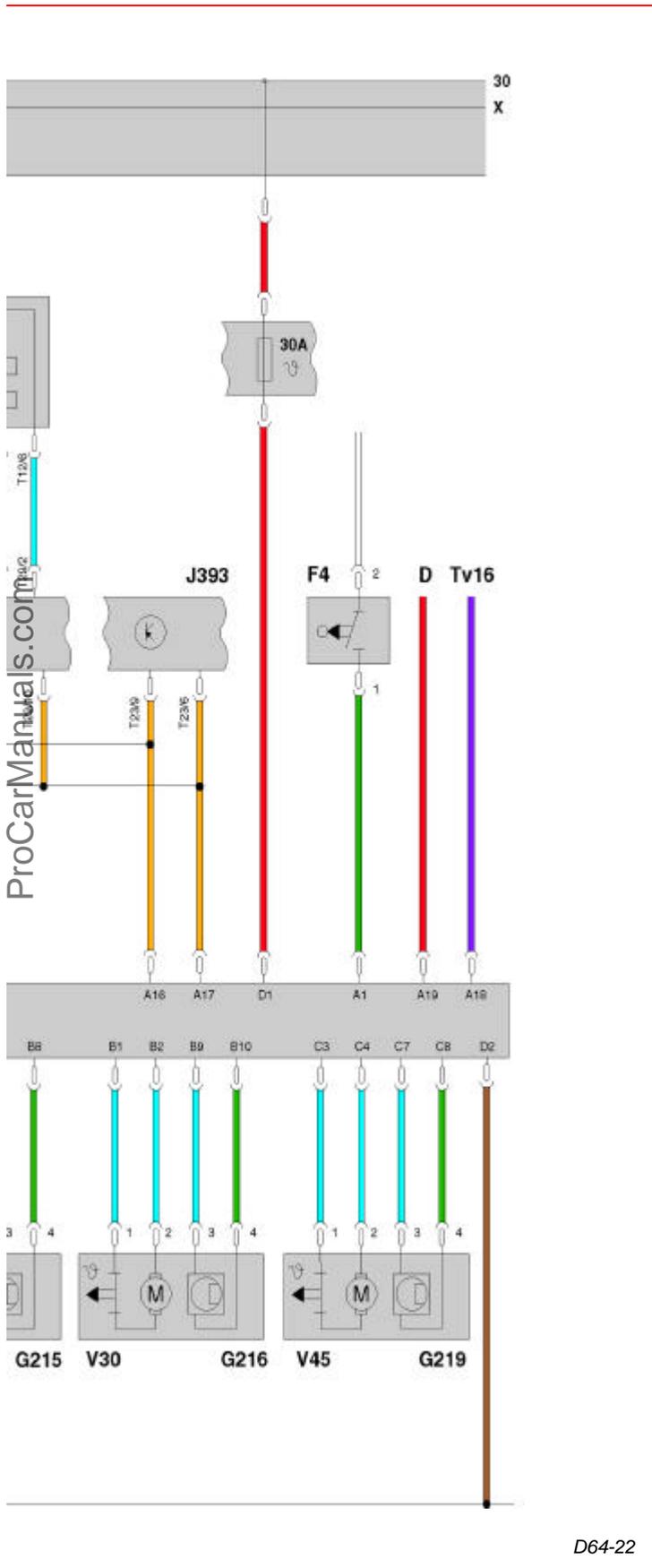
If the **door remains open**, a single touch on the button is sufficient to recover the position of the seat and rear view mirrors.

When the control unit detects no further signals from hall senders, it disconnects the motor after 2.5 seconds and considers the memory recovery complete. When the first impulse has been received, the disconnection time is reduced to 0.2 seconds, if no other one is received. This prevents the seat from adopting dangerous positions for the driver.

**Note:** If the emergency switch or any adjustment switch is pressed during memory recovery, this process will be immediately cancelled.

# FUNCTIONAL WIRNG DIAGRAM





## COLOUR CODING

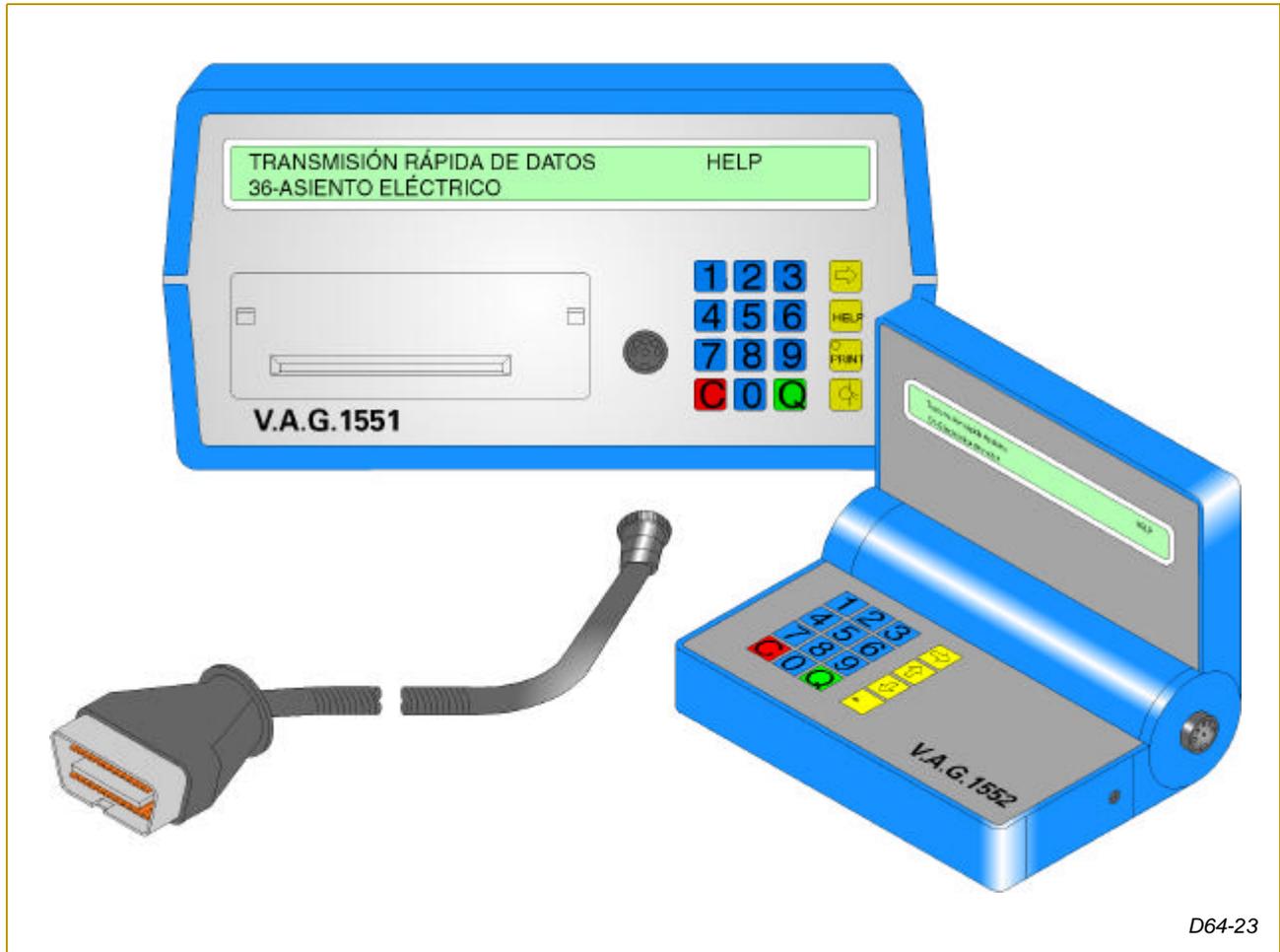
	Green	Input signal
	Blue	Output signal
	Red	Positive
	Brown	Earth
	Lilac	Bi- directional signal
	Yellow	CAN BUS

## LEGEND

<b>D</b>	Ignition.
<b>E43</b>	Mirror setting and folding control.
<b>E48</b>	Mirror selection control.
<b>E61</b>	Longitudinal adjustment switch.
<b>E62</b>	Inclination adjustment switch.
<b>E63</b>	Height adjustment switch.
<b>E96</b>	Backrest adjusting switch.
<b>E97</b>	Memory buttons and emergency switch.
<b>F4</b>	Reverse lights switch.
<b>F220</b>	Driver's door contact switch.
<b>G215</b>	Inclination adjustment hall sender.
<b>G216</b>	Height adjustment hall sender.
<b>G218</b>	Longitudinal adjustment hall sender.
<b>G219</b>	Backrest adjustment hall sender.
<b>J136</b>	Control unit for adjustment of seat with memory.
<b>J386</b>	Driver's door module.
<b>J387</b>	Passenger's door module.
<b>J393</b>	Central control unit .
<b>Tv16</b>	Autodiagnosis connector.
<b>V17</b>	Motor and potentiometer for setting of mirror "Y" axis, (driver's side).
<b>V25</b>	Motor and potentiometer for setting of mirror "Y" axis, (passenger's side).
<b>V28</b>	Longitudinal adjustment motor.
<b>V29</b>	Inclination adjustment motor.
<b>V30</b>	Height adjustment motor.
<b>V45</b>	Backrest adjustment motor.
<b>V121</b>	Mirror folding motor (driver's door).
<b>V122</b>	Mirror folding motor (passenger's door).
<b>V149</b>	Motor and potentiometer for setting of mirror "X" axis, (driver's door).
<b>V150</b>	Motor and potentiometer for setting of mirror "X" axis, (passenger's door).
<b>S</b>	Fuse.
<b>Z4</b>	Mirror heating (driver's door).
<b>Z5</b>	Mirror heating (passenger's door).

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# AUTODIAGNOSIS



The control unit of the electric seats has a complete autodiagnosis system.

This autodiagnosis enables the correct operation of the sensors and actuators which take part in the settings to be checked. Access to the autodiagnosis system can be obtained using the direction code “**36-Driver’s electric seat**”.

The autodiagnosis memorises both permanent and sporadic faults.

Here below we will point out some of the functions which can be carried out with the fault reader.

## FUNCTION:

- |    |                                     |
|----|-------------------------------------|
| 01 | Consult control unit version.       |
| 02 | Consult fault memory.               |
| 03 | Actuator diagnosis.                 |
| 04 | Start basic setting.                |
| 05 | Erase fault memory.                 |
| 06 | Terminate emission.                 |
| 07 | Code the control unit.              |
| 08 | Read table of values.               |
| 09 | Read individual measurement values. |
| 10 | Adaptation.                         |



# AUTODIAGNOSIS

## FUNCTION "08": TABLE OF MEASUREMENT VALUES

The analysis and evaluation of the table of values will enable us to diagnose possible faults not shown in the fault memory.

When the function "08-Read table of values" is selected, we should introduce the group number that we want to visualize.

There are 6 groups in order from 001 to 006.

Reading of measurement values 1				
	1	2	3	4
<b>Display zones</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>

The meaning of the measurement values for the remaining groups is shown on the following table::

GROUP	DISPLAY ZONE			
	1	2	3	4
<b>001</b>	MEMORY BUTTONS M1 M2 M3	EMERGENCY SWITCH AND DRIVER'S DOOR CONTACT SWITCH	NO.OF REMOTE CONTROLS MEMORISED	FREE
<b>002</b>	SIGNAL FROM THE LONGITUDINAL DISPLACEMENT SWITCH	LONGITUDINAL DISPLACEMENT COUNTER	SINGAL FROM BACKREST FOLDING SWITCH	BACKREST FOLDING COUNTER
<b>003</b>	SIGNAL FROM FRONT CUSHION HEIGHT SWITCH	FRONT CUSHION HEIGHT COUNTER	SIGNAL FROM REAR CUSHION HEIGHT SWITCH	REAR CUSHION HEIGHT COUNTER
<b>004</b>	CONDITION OF HORIZONTAL POTENTIOMETER OF LEFT MIRROR	CONDITION OF VERTICAL POTENTIOMETER OF LEFT MIRROR	CONDITION OF HORIZONTAL POTENTIOMETER OF RIGHT MIRROR	CONDITION OF VERTICAL POTENTIOMETER OF RIGHT MIRROR
<b>005</b>	ON BOARD VOLTAGE AT TERMINAL 30	Xxx IGNITION xXx REVERSE GEAR xxX PRE SETTING	OTOR STOP Xxx BLOCKED xXx LIMIT REACHED xxX TIME EXPIRED	FREE
<b>006</b>	CAN Bus LINE	FREE	FREE	FREE



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Technical state 07.98. Owing to the constant development and improvement of the product, the information which appear herein is subject to possible alterations. The handbook is for exclusive use of the commercial organization SEAT.  
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